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FLOOD INSURANCE STUDY

TOWN OF COLLEYVILLE, TEXAS
TARRANT COUNTY

JUNE 1, 1982

Federal Emergency Management Agency

COMMUNITY NUMBER - 480590

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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Purpose of Study	1
1.2	Authority and Acknowledgments	1
1.3	Coordination	1
2.0	AREA STUDIED	2
2.1	Scope of Study	2
2.2	Community Description	2
2.3	Principal Flood Problems	2
2.4	Flood Protection Measures	4
3.0	ENGINEERING METHODS	4
3.1	Hydrologic Analyses	4
3.2	Hydraulic Analyses	5
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	6
4.1	Flood Boundaries	6
4.2	Floodways	7
5.0	INSURANCE APPLICATION	11
5.1	Reach Determinations	12
5.2	Flood Hazard Factors	12
5.3	Flood Insurance Zones	12
5.4	Flood Insurance Rate Map Description	13

BEST DOCUMENT AVAILABLE

TABLE OF CONTENTS - continued

		Page
6.0	OTHER STUDIES	13
7.0	LOCATION OF DATA	13
8.0	BIBLIOGRAPHY AND REFERENCES	15

FIGURES

Figure 1-	Vicinity Map	3
Figure 2-	Floodway Schematic	11

TABLES

Table 1-	Summary of Discharges	5
Table 2-	Floodway Data	8-10
Table 3-	Flood Insurance Zone Data	14

EXHIBITS

Exhibit 1-	Flood Profiles	
	Bear Creek	Panel 01P
	Little Bear Creek	Panels 02P-03P
	Tributary Little Bear 1	Panels 04P-05P
	Tributary Little Bear 2	Panels 06P-07P
Exhibit 2-	Flood Boundary and Floodway Map Index	
Exhibit 3-	Flood Boundary and Floodway Map	

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index

Flood Insurance Rate Map

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1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Colleyville, Tarrant County, Texas, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the Town of Colleyville to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by U.S. Army Corps of Engineers (COE), Fort Worth District, for the Federal Emergency Management Agency, under Interagency Agreement No. (IAA)-H-979, Project Order No. 8. This study was completed in November 1980.

1.3 Coordination

Community base map selection and the identification of streams requiring detailed study were done during the initial coordination meeting held on February 8, 1979, attended by the city coordinator, the Community Coordination Officer (CCO), and a COE representative. The Soil Conservation Service (SCS), the U.S. Geological Survey (USGS), the State Department of Highways and Public Transportation, and the Texas Department of Water Resources were contacted for information related to the study.

On May 27, 1981, the results of the study were reviewed at the final meeting attended by representatives of the study contractor, FEMA, and community officals. The study was acceptable to the community.

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2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Colleyville. The area of study is shown on the Vicinity Map (Figure 1).

Detailed hydrologic and hydraulic studies were made on Bear Creek, Little Bear Creek, and two small tributaries to Little Bear Creek.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through November 1985.

2.2 Community Description

The Town of Colleyville is located in north central Texas in the northeast portion of Tarrant County. The total land area within the town is about 13 square miles, and it is situated about 12 miles northeast of downtown Fort Worth. The Town of Colleyville is bounded on the north by the City of Southlake, on the east by the Cities of Grapevine and Euless, on the south by the Cities of Bedford and Hurst, and on the west by the Cities of North Richland Hills and Keller. The Texas Municipal League lists the estimated 1979 population as 5,500. The Town of Colleyville is primarily a residental community with some commercial development.

The topography is gently rolling to almost level, with elevations in the community varying from about 535 to 710 feet above National Geodetic Vertical Datum of 1929 (NGVD). The soils in the area are generally deep loamy surface soils with clayey subsoils. The native vegetation in the undeveloped area consists of bunch and short grasses with scattered oak and mesquite trees. The town is drained by Bear Creek and its tributaries.

The Colleyville area has a generally mild climate with a large range of annual and daily temperatures. Freezing temperatures and snowfall are occasionally experienced during winter months. Summer temperatures are hot with moderately warm nights. The mean annual temperature in the area is about 66 degrees F. Extremes in temperature range from a minimum of minus 8 degrees F to a maximum of 113 degrees F. The mean annual rainfall is 32.3 inches.

2.3 Principal Flood Problems

Most of the flood producing storms that occur in the Colleyville area are experienced in the spring and fall. Most of the higher floods that have occured in the general geographical region have resulted from prolonged or successive storms that produce heavy rainfall during this period; however, severe flooding can be produced by intense local thunderstorms at any time.

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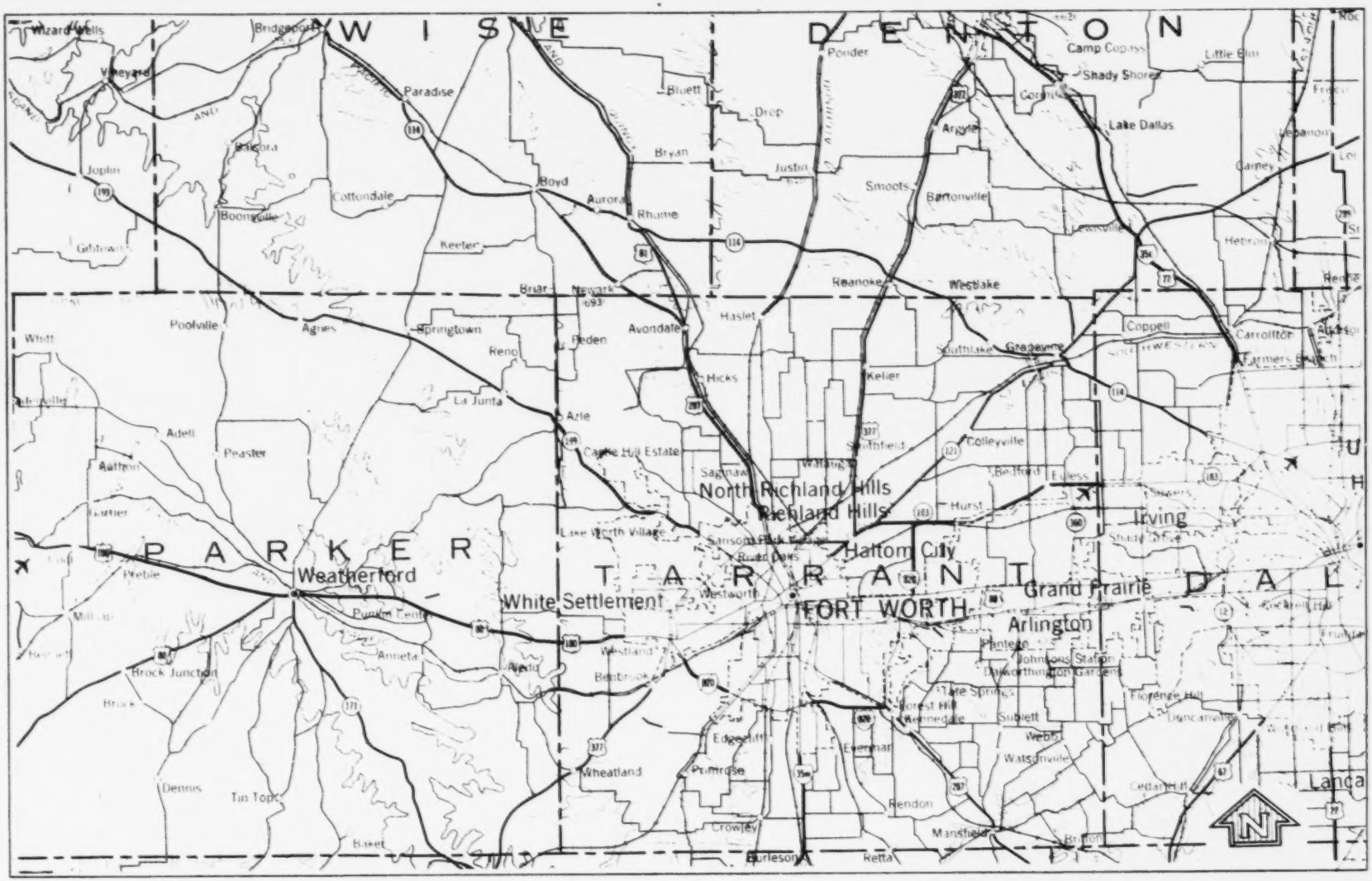

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX

(TARRANT CO.)

APPROXIMATE SCALE

8 0 8 16 24

VICINITY MAP

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The USGS has maintained a stream gaging station on Bear Creek at State Highway 26 (old Highway 121) since 1966. Due to the short duration of records at this station, most of the historical flood information on Bear Creek was obtained from the Bear Creek Flood Plain Information Report published in 1971 (Reference 1) and interviews with local residents. From these sources it is known that large floods occurred in 1935, 1942, 1949, 1957, 1962, 1964, and 1966. The relative magnitudes of these historical floods vary from one reach of the stream to the other due primarily to differences in rainfall intensity and volume at different points in the watershed; therefore, no attempt was made to estimate the recurrence interval.

2.4 Flood Protection Measures

There are no significant flood control structures in the study area. The Town of Colleyville currently regulates flood plain development through a zoning ordinance.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in 10), and for any 90 year period, the risk increases to about 60 percent (six in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

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Each stream was divided into subareas, and synthetic unit and flood hydrographs were developed at selected locations. National Weather Service Technical Paper Number 40 (Reference 2) was used in developing the 10-, 50-, and 100-year storms. The 500-year storm was based on extrapolated data. Frequency peak discharges at selected locations were computed. Drainage area-peak relationships for each stream studied are shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
BEAR CREEK					
At State Highway 26	30.26	9,400	15,100	18,300	24,500
Below Big Bear Tributary 7	25.09	8,600	14,200	17,100	23,700
At Farm Road 1938	17.77	8,600	13,500	15,800	20,500
LITTLE BEAR CREEK					
Below Little Bear Tributary 1	18.02	6,400	10,400	12,400	16,700
At Chesire Road	13.57	5,100	8,000	9,600	12,500
At State Highway 26	11.16	4,400	6,400	7,500	9,500
At St. Louis and Southwestern Railroad	8.20	4,400	6,400	7,400	9,400
TRIBUTARY LITTLE BEAR 1					
Confluence with Little Bear Creek	1.40	1,900	2,650	3,000	3,800
TRIBUTARY LITTLE BEAR 2					
Confluence with Little Bear Creek	1.22	1,600	2,250	2,500	3,150

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the Town of Colleyville were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Water-surface elevations of floods of the selected recurrence intervals for each stream were computed through use of the COE HEC-2 step-backwater computer program (Reference 3). Cross sections for the backwater analysis were field surveyed and were located at close intervals above or below bridges and culverts in order to compute the significant backwater effects of these structures. Channel roughness factors (Manning's "n") for these computations were assigned on the basis of field inspections of flood plain areas. Following is a list of "n" value ranges.

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Stream Name	Channel	Overbank
Bear Creek	.060-.030	.085-.070
Little Bear Creek	.065-.045	.090-.050
Tributary Little Bear 1	.065-.030	.085-.065
Tributary Little Bear 2	.070-.040	.090-.065

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.1 foot for floods of the selected recurrence intervals (Exhibit 1). The flood profiles for Big Bear and Little Bear Creeks were compared to previous studies for verification of results (Reference 1). The starting water-surface elevations were based on slope area. All elevations are measured from National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in the study are shown and described on the maps. For study purposes, it was assumed that no clogging would occur and that all bridge structures would stand intact. Significant changes in this premise, imposed by differing conditions of a future flood, could alter the estimated flood elevations and flood limits shown on profiles and maps. Locations of selected cross sections used in the hydraulic analysis are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are shown on the Flood Boundary and Floodway Maps (Exhibit 3).

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the available topographic map with a contour interval of 10 feet (Reference 4). In cases where the 100-year and 500-year flood boundaries are close together, only the 100-year boundary has been shown. Small areas within the flood boundaries may lie above the flood elevations and therefore not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

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To assist users of the flood insurance report data in locating the actual boundaries of the base flood or for determining the elevation of specific sites or structures in relation to the base flood, elevation reference marks are shown and described on maps. These reference marks were established by the COE during the course of this study. Flood boundaries are indicated on the Flood Boundary and Floodway Map.

On this map, the 100-year flood boundary corresponds to the boundary of the areas of special flood hazards; and the 500-year flood boundary corresponds to the boundary of areas of moderate flood hazards.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodway presented in this study was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected field cross sections for each stream segment for which a floodway is computed (Table 2). As shown on the Flood Boundary and Floodway Map, the floodway boundaries were determined at cross sections; between cross sections the boundaries were interpolated.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Bear Creek								
M	105,100	770/260[2]	6,070	3.0	572.7	572.7	573.5	0.8
N	107,740	697	4,918	3.7	575.5	575.5	576.5	1.0
O	109,530	775/630[2]	5,778	3.2	579.1	579.1	579.8	0.7
P	110,690	508/390[2]	3,687	5.0	581.5	581.5	582.3	0.8
Q	113,570	700/620[2]	5,733	3.2	587.2	587.2	587.9	0.7
R	115,740	720/340[2]	5,178	3.3	590.5	590.5	591.3	0.8
S	118,460	855/60[2]	7,140	2.4	596.6	596.6	597.5	0.9
T	119,810	491/300[2]	4,097	4.2	598.2	598.2	599.2	1.0
U	121,600	506/120[2]	4,596	3.7	602.5	602.5	603.2	0.7
V	123,530	914/590[2]	7,775	2.2	604.5	604.5	605.4	0.9
W	124,970	395/210[2]	3,321	5.2	605.9	605.9	606.9	1.0
Little Bear Creek								
A	24,200	550	3,475	3.6	549.3	549.3	550.3	1.0
B	27,320	755	4,352	2.8	553.8	553.8	554.8	1.0
C	31,670	694	4,204	3.0	563.4	563.4	564.4	1.0
D	33,690	531	3,761	3.3	569.9	569.9	570.6	0.7
E	36,590	389	2,455	3.9	574.1	574.1	574.9	0.8
F	38,550	508	3,370	2.8	577.8	577.8	578.4	0.6
G	41,130	879	4,685	2.0	580.1	580.1	580.7	0.6

[1]Feet above confluence with West Fork of Trinity River for Bear Creek; feet above confluence with Bear Creek for Little Bear Creek.
[2]Total width/width within corporate limits.

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX

(TARRANT CO.)

FLOODWAY DATA

BEAR CREEK LITTLE BEAR CREEK

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Little Bear Creek (cont.)								
H	45,080	674	2,925	2.6	588.1	588.1	588.3	0.2
I	47,120	449	2,330	3.2	592.7	592.7	593.6	0.9
J[2]	51,040	519	2,859	2.6	600.4	600.4	601.3	0.9
Tributary Little Bear 1								
A	940	159	435	6.9	554.9	554.9	555.1	0.2
B	1,630	140	675	4.4	561.4	561.4	562.4	1.0
C	1,855	154	1,154	2.6	564.4	564.4	565.0	0.6
D	2,550	137	989	2.8	568.1	568.1	568.9	0.8
E	2,950	74	268	7.2	568.9	568.9	569.5	0.6
F[2]	3,400	74	364	5.3	572.9	572.9	573.8	0.9

[1]Feet above confluence with Bear Creek for Little Bear Creek; feet above confluence with Little Bear Creek for Tributary Little Bear 1.
[2]Floodway lies outside corporate limits.

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX
(TARRANT CO.)

FLOODWAY DATA

LITTLE BEAR CREEK-TRIBUTARY LITTLE BEAR 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Tributary Little Bear 2								
A	3,020	208	1,385	1.8	603.7	603.7	604.5	0.8
B	3,850	162	695	3.0	604.5	604.5	605.4	0.9
C	4,950	154	496	4.2	608.4	608.4	609.4	1.0
D	5,600	128	527	4.0	611.8	611.8	612.6	0.8
E	6,320	83	420	3.8	618.1	618.1	619.0	0.9
F	6,900	88	353	4.5	620.3	620.3	621.0	0.7
G	8,000	100	895	1.8	628.7	628.7	629.0	0.3
H	8,300	100	703	1.8	628.8	628.8	629.2	0.4
I	8,710	100	447	2.9	628.9	628.9	629.9	1.0

[1]Feet above confluence with Little Bear Creek.

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX

(TARRANT CO.)

FLOODWAY DATA

TRIBUTARY LITTLE BEAR 2

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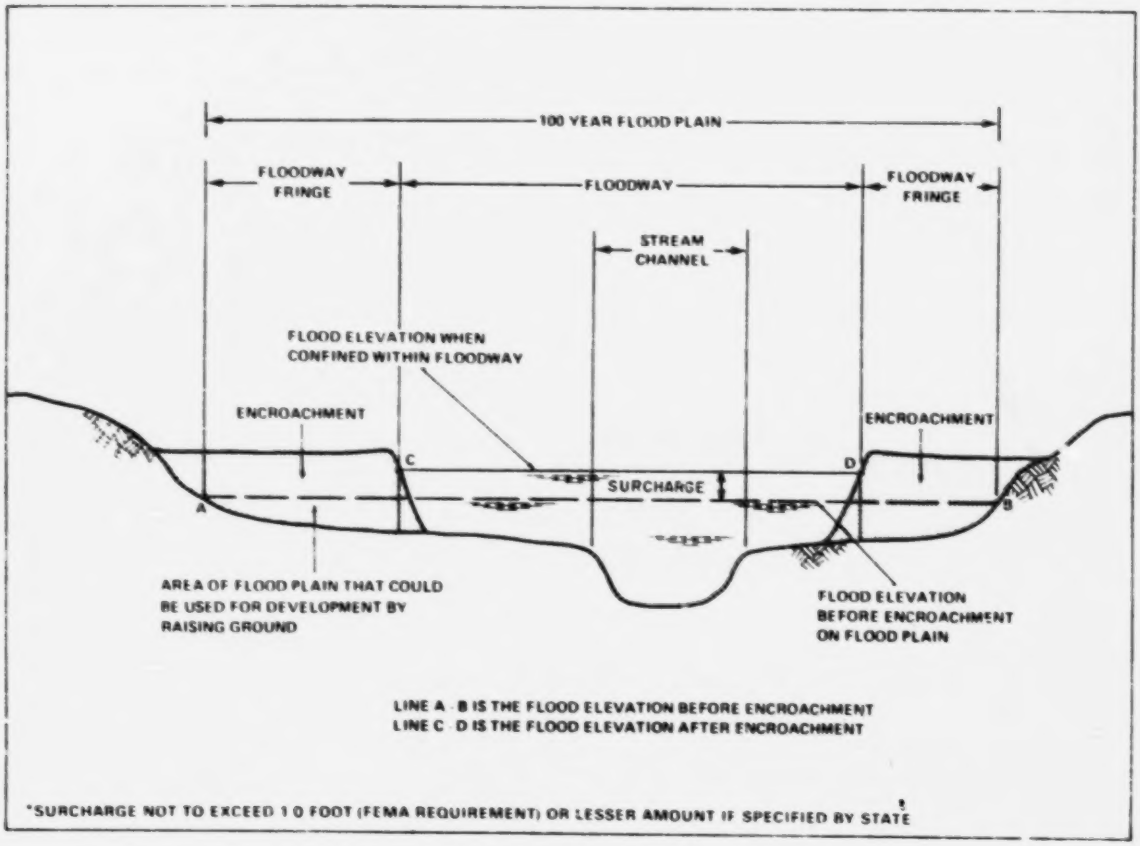
100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FLOODWAY SCHEMATIC Figure 2

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each significant flooding source affecting the Town of Colleyville.

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5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot

The location of reaches determined for the flooding sources of the Town of Colleyville are shown on the Flood Profiles (Exhibit 1).

5.2 Flood Hazard Factors (FHFs)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, the accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Town of Colleyville was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zones A1, A2, A4, and A6:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.

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Zone B: Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevation for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Colleyville is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

A Flood Plain Information Report entitled, Bear Creek, Dallas and Tarrant Counties, Texas (Reference 1) was prepared by the COE and published in June 1971. The profiles developed in this report are in reasonable agreement with those in the present study considering differences in watershed and stream conditions and the fact that additional cross sections were obtained for this study. Since each of these studies was made by the COE, reconciliation of these differences was made within the agency.

Flood insurance studies for the adjacent Cities of Grapevine, Southlake, and Keller are being prepared concurrently with this study; therefore, no conflicts in data are expected.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Federal Center, Denton, Texas 76201.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Bear Creek							
Reach 1	0005	-2.9	-0.9	+1.6	030	A6	Varies
Little Bear Creek							
Reach 1	0010	-1.9	-0.5	+1.0	020	A4	Varies
Reach 2	0010	-1.2	-0.3	+0.7	010	A2	Varies
Tributary Little Bear 1							
Reach 1	0010	-0.7	-0.2	+0.4	005	A1	Varies
Tributary Little Bear 2							
Reach 1	0005, 0010	-0.8	-0.2	+0.5	010	A2	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX
(TARRANT CO)

FLOOD INSURANCE ZONE DATA

BEAR CREEK-LITTLE BEAR CREEK-
TRIBUTARY LITTLE BEAR 1-TRIBUTARY LITTLE BEAR 2

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8.0 BIBLIOGRAPHY AND REFERENCES

1. Corps of Engineers, Flood Plain Information Report, Bear Creek, Dallas and Tarrant Counties, Texas, June 1971.

2. National Weather Service, Technical Paper Number 40, Rainfall Frequency Atlas of the United States, May 1961.

3. Corps of Engineers, HEC-2, Water-Surface Profiles, Hydrologic Engineering Center, Davis, California, February 1972.

4. U.S. Geological Survey, 7½-Minute Quadrangle Maps: Colleyville, Texas; Grapevine, Texas; Hurst, Texas; and Euless, Texas, all dated 1959 and photorevised in 1968 and 1973.

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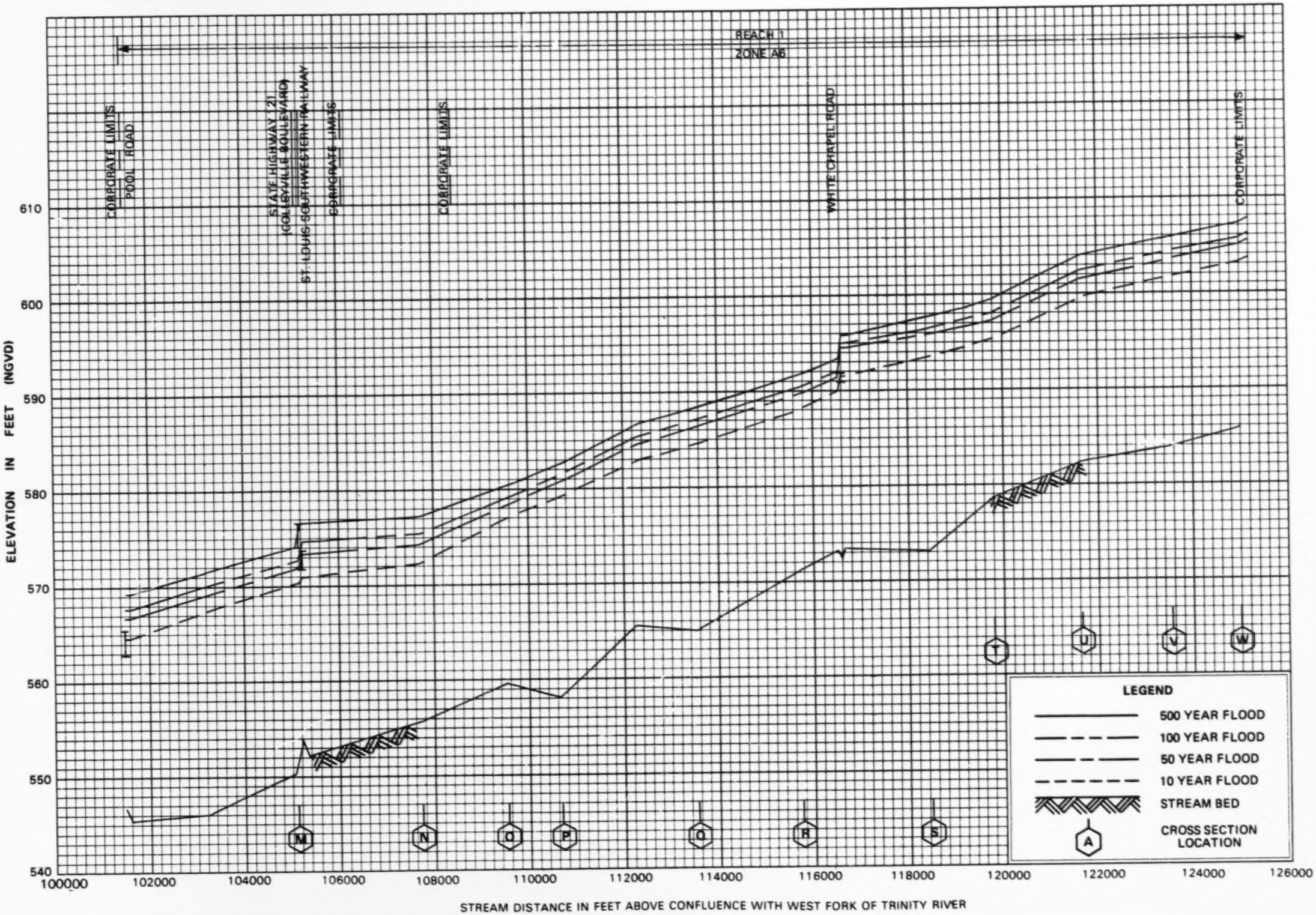

FLOOD PROFILES

BEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX
(TARRANT CO.)

01P

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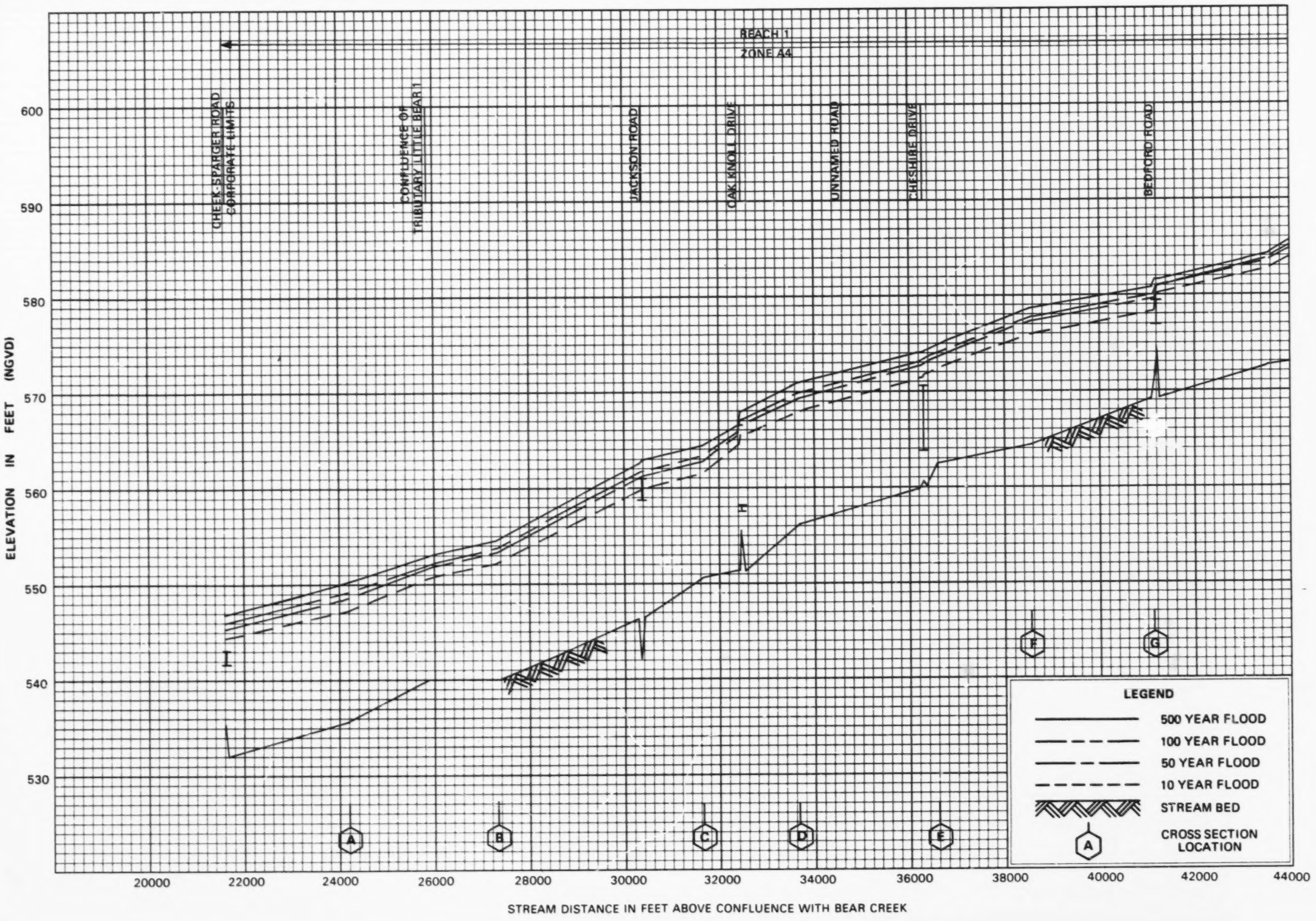

FLOOD PROFILES

LITTLE BEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX
(TARRANT CO.)

02P

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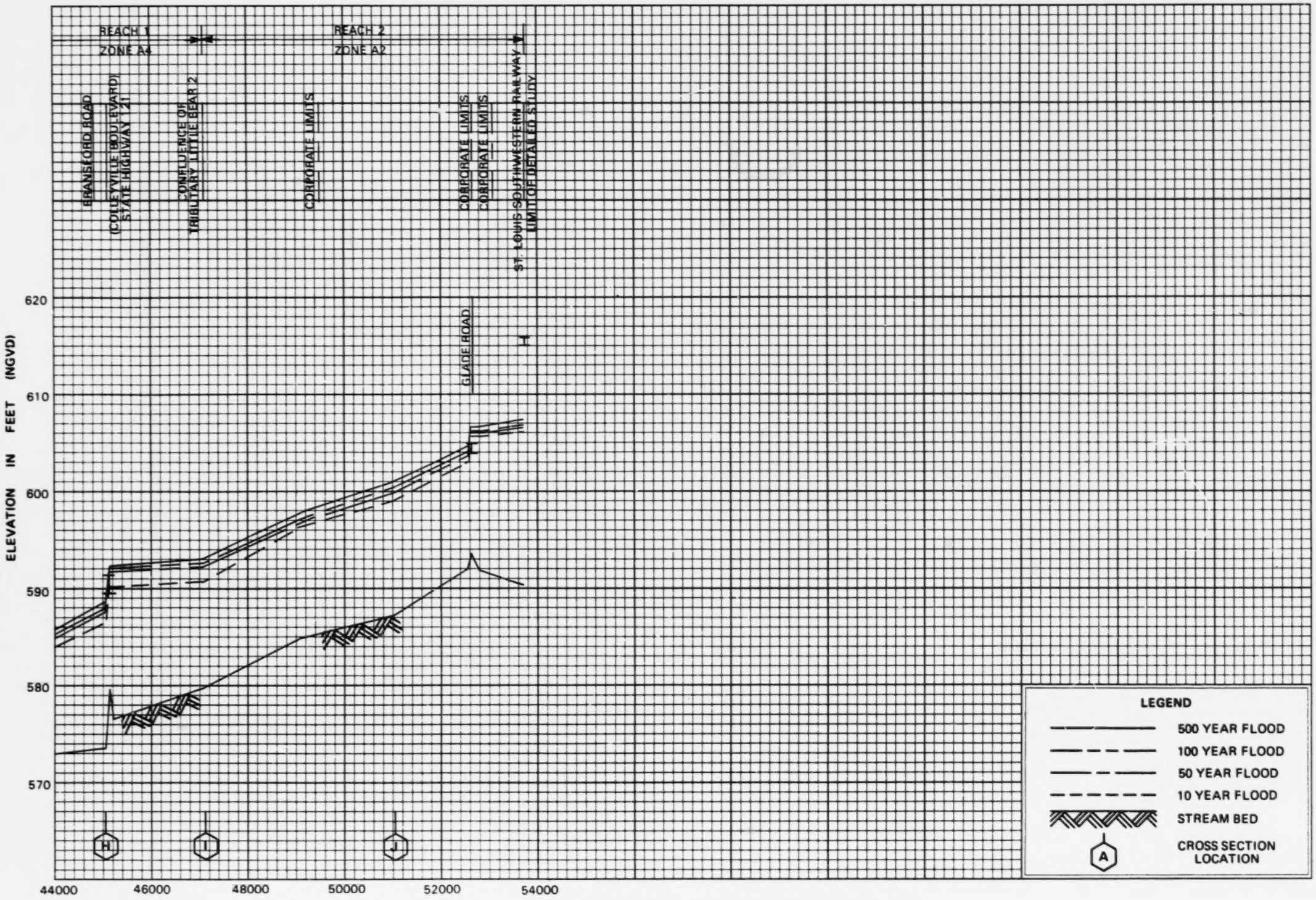

FLOOD PROFILES

LITTLE BEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX
(TARRANT CO.)

03P

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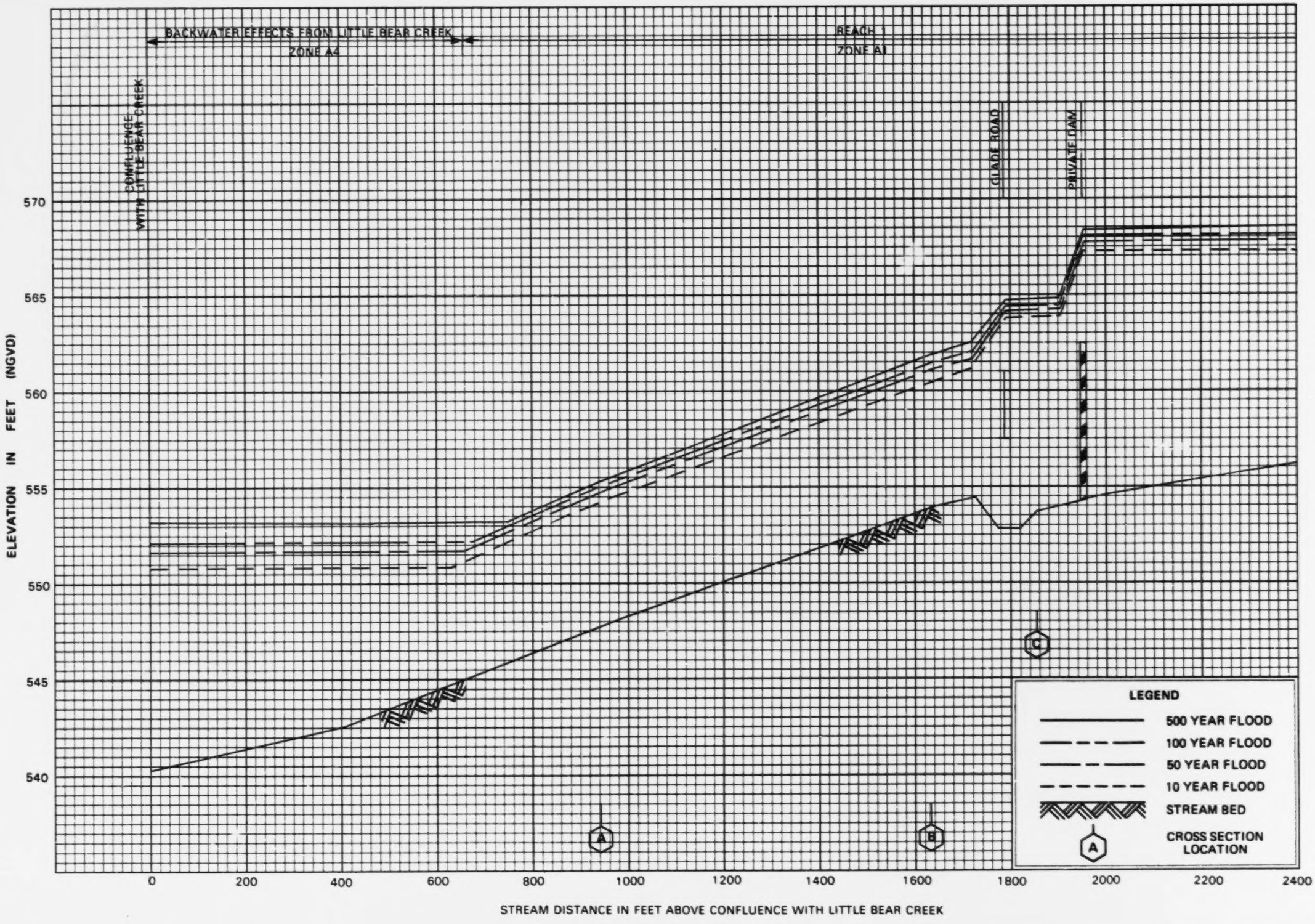

FLOOD PROFILES

TRIBUTARY LITTLE BEAR 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX
(TARRANT CO.)

04P

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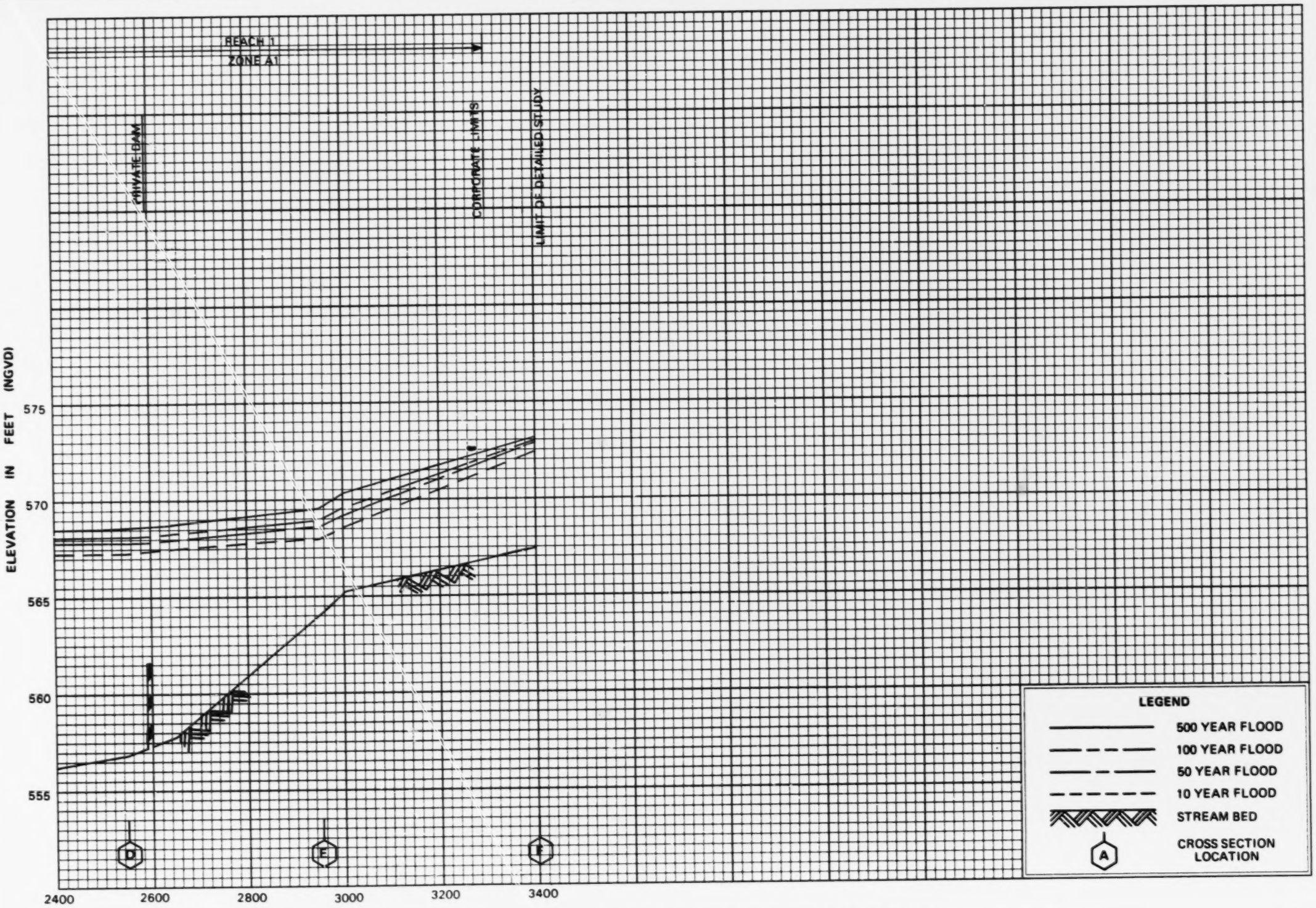

FLOOD PROFILES

TRIBUTARY LITTLE BEAR 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX
(TARRANT CO.)

05P

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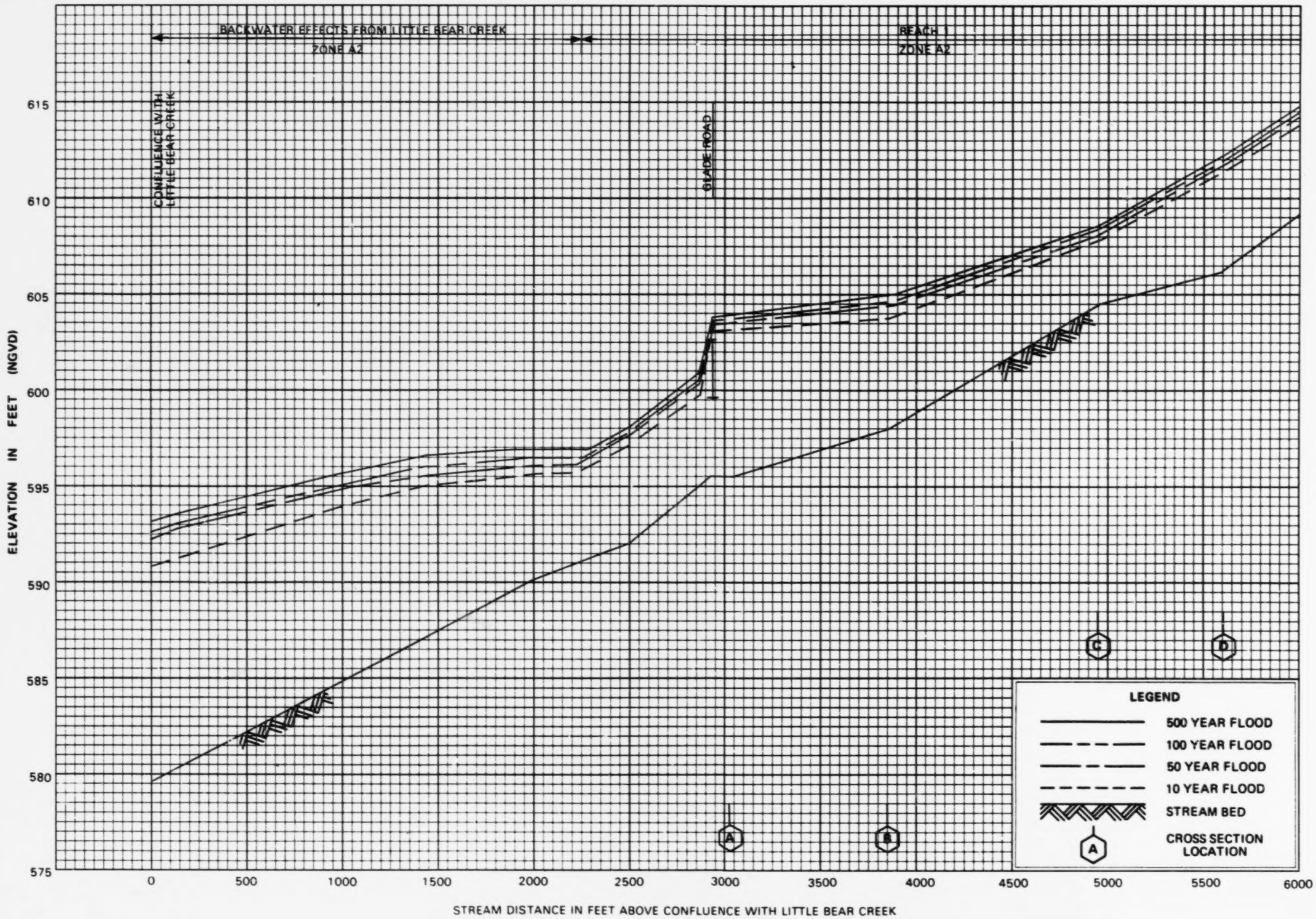

FLOOD PROFILES

TRIBUTARY LITTLE BEAR 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX
(TARRANT CO.)

06P

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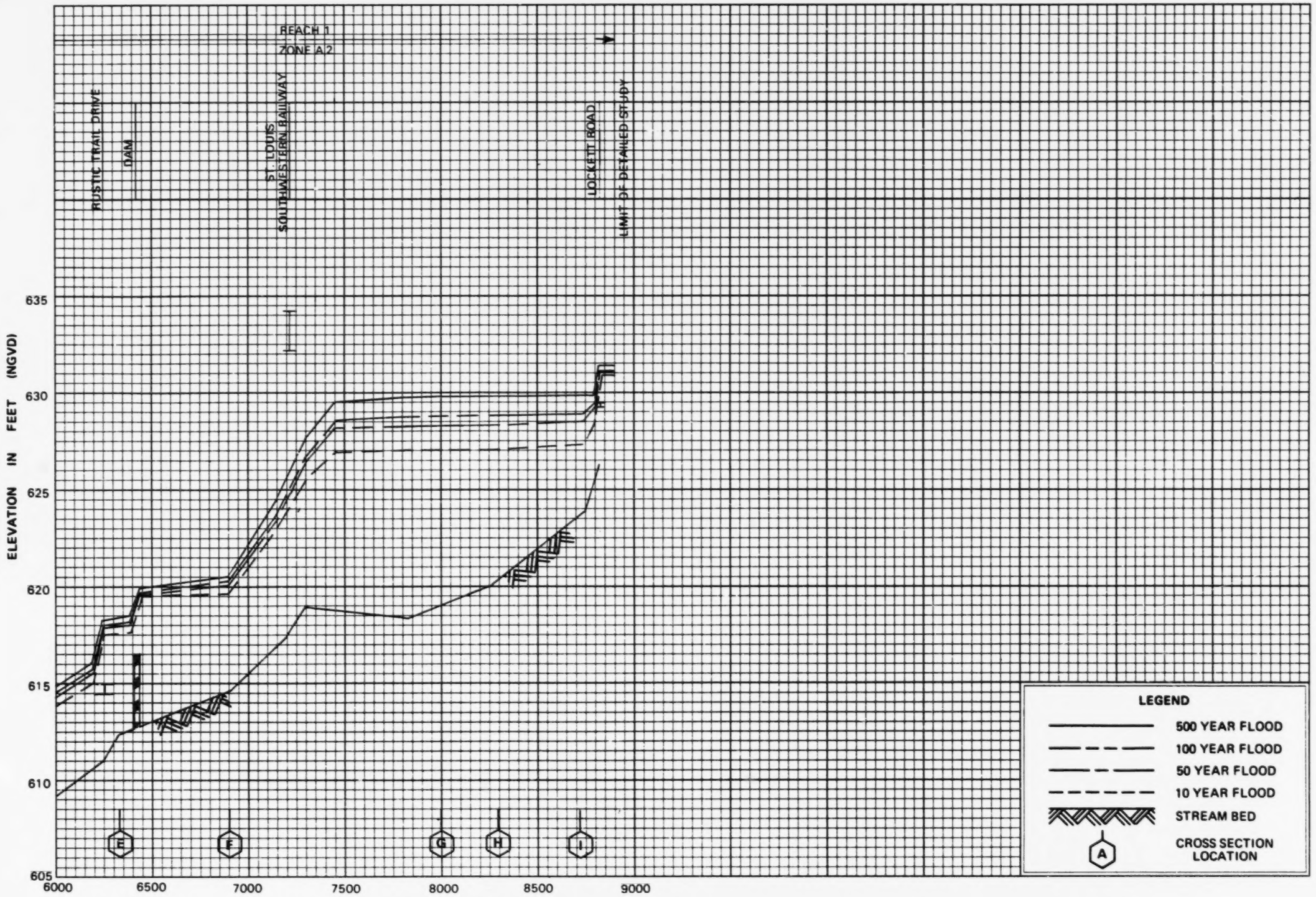

FLOOD PROFILES

TRIBUTARY LITTLE BEAR 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF COLLEYVILLE, TX
(TARRANT CO.)

07P